CLAIMS

What is claimed is:

1. An infectious chimeric nucleic acid molecule of porcine circovirus (PCV1-2) comprising a nucleic acid molecule encoding an infectious, nonpathogenic PCV1 which contains an immunogenic open reading frame (ORF) gene of a pathogenic PCV2 in place of an ORF gene of the PCV1 nucleic acid molecule.

2. The chimeric nucleic acid molecule according to Claim 1, wherein the immunogenic PCV2 ORF gene replaces the same ORF gene position in the PCV1 nucleic acid molecule.

3. The chimeric nucleic acid molecule according to Claim 2, wherein the immunogenic ORF gene is the ORF2 capsid gene.

4. The chimeric nucleic acid molecule according to Claim 3, wherein the chimeric nucleic acid molecule has a nucleotide sequence set forth in SEQ ID NO:2, its complementary strand or a nucleotide sequence which has at least 95% homology to the nucleotide sequence of SEQ ID NO:2.

5. The chimeric nucleic acid molecule according to Claim 4, wherein the chimeric nucleic acid molecule contains a mutation in the ORF2 gene comprising a guanine in nucleotide position 328 (C to G), a cytosine in nucleotide position 573 (A to C) or both C to G and A to C mutations in positions 328 and 573, respectively.

6. A biologically functional plasmid or viral vector containing the chimeric nucleic acid molecule according to Claim 4.

7. The plasmid according to Claim 6 having ATCC Patent Deposit Designation PTA-3912.

8. A suitable host cell transfected by a vector comprising the chimeric nucleic acid molecule according to Claim 4.

9. An avirulent, infectious chimeric porcine circovirus produced by cells containing the chimeric nucleic acid molecule according to Claim 4.

10. The infectious chimeric porcine circovirus according to Claim 9, wherein the cells containing the chimeric nucleic acid molecule are contained in or derived from a plasmid having ATCC Patent Deposit Designation PTA-3912.

11. A process for the production of an immunogenic polypeptide product, said process comprising: growing, under suitable nutrient conditions, prokaryotic or eucaryotic host cells transfected with a nucleic acid molecule according to Claim 4 in a manner allowing expression of said polypeptide product, and isolating the desired polypeptide product of the expression of said nucleic acid molecule.

12. An immunogenic polypeptide product of the expression according to Claim 11.

13. An immunogenic polypeptide having the amino acid sequence set forth in SEQ ID NO:4 or a biologically active variant thereof.

14. The biologically active variant of the polypeptide according to Claim 13, wherein the amino acid sequence contains a mutation comprising P110A, R191S or both P110A and R191S.

15. A viral vaccine that protects a pig against viral infection or postweaning multisystemic wasting syndrome (PMWS) caused by PCV2 comprising a nontoxic, physiologically acceptable carrier and an immunogenic amount of a member selected from the group consisting of:

(a) a chimeric nucleic acid molecule having a nucleotide sequence set forth in SEQ ID NO:2, its complementary strand or a nucleotide sequence having at least 95% homology to the nucleotide sequence of SEQ ID NO:2;

(b) a biologically functional plasmid or viral vector containing the chimeric nucleic acid molecule, the complementary strand or the nucleotide sequence having at least 95% homology to the nucleotide sequence of SEQ ID NO:2;

(c) an avirulent, infectious chimeric porcine circovirus;

(d) a polypeptide having the amino acid sequence set forth in SEQ ID NO:4 or a biologically active variant thereof;

(e) an infectious PCV2 molecular DNA clone having ATCC Patent Deposit Designation PTA-3913 or a PCV2 DNA clone derived therefrom; and

(f) a biologically functional plasmid or viral vector containing the infectious PCV2 molecular DNA clone having ATCC Patent Deposit Designation PTA-3913 or the PCV2 DNA clone derived therefrom.

16. The viral vaccine according to Claim 15, wherein the chimeric nucleic acid molecule contains a mutation in the ORF2 gene comprising C to G in nucleotide position 328, A to C

in nucleotide position 573 or both C to G and A to C mutations in positions 328 and 573, respectively.

17. The viral vaccine according to Claim 15, wherein the biologically active variant of the polypeptide contains a mutation comprising P110A, R191S or both P110A and R191S.

18. The viral vaccine according to Claim 15, wherein the vaccine contains live chimeric porcine circovirus.

19. A method of protecting a pig against viral infection or postweaning multisystemic wasting syndrome (PMWS) caused by PCV2 comprising administering to the pig in need of protection an immunologically effective amount of the vaccine according to Claim 15.

20. The method according to Claim 19, which comprises administering the chimeric nucleic acid molecule or live chimeric porcine circovirus to the pig.

21. The method according to Claim 20, which comprises administering the vaccine parenterally, intranasally, intradermally or transdermally to the pig.

22. The method according to Claim 21, which comprises administering the vaccine intralymphoidly or intramuscularly to the pig.

23. A method of preparing the infectious chimeric nucleic acid molecule of PCV1-2 according to Claim 1, which comprises removing an open reading frame (ORF) gene of a nucleic acid molecule encoding an infectious, nonpathogenic PCV1; replacing the ORF gene position of the PCV1 with an immunogenic ORF gene from a pathogenic PCV2; and recovering the chimeric nucleic acid molecule.

24. The method according to Claim 23, wherein the immunogenic PCV2 ORF gene replaces the same ORF gene position of the PCV1 nucleic acid molecule.

25. The method according to Claim 24, wherein the immunogenic ORF gene is ORF2.

26. The method according to Claim 25, wherein the ORF2 gene of PCV2 is obtained from the molecular nucleic acid molecule of PCV2 contained in an expression vector having ATCC Patent Deposit Designation PTA-3913.

27. The method according to Claim 25, wherein the ORF2 gene of PCV2 is excised from a PCV2 after at least 30 serial passages of the PCV2 in PK-15 cells.

28. The method according to Claim 27, wherein the ORF2 gene of PCV2 is excised from the PCV2 after 120 serial passages of the PCV2 in PK-15 cells.

29. An infectious PCV2 molecular DNA clone having ATCC Patent Deposit Designation PTA-3913 or a PCV2 DNA clone derived therefrom.

30. A biologically functional plasmid or viral vector containing the infectious PCV2 molecular DNA clone according to Claim 29.

31. An isolated and mutated nucleic acid molecule of an immunogenic ORF2 capsid gene from PCV2 having a nucleotide sequence set forth in SEQ ID NO:3, its complementary strand or a nucleotide sequence which has at least 95% homology to the nucleotide sequence of SEQ ID NO:3 in which the mutation comprises C to G in nucleotide position 328, A to C in nucleotide position 573 or both C to G and A to C mutations in positions 328 and 573, respectively.

32. An infectious reciprocal chimeric nucleic acid molecule of PCV2-1 comprising a nucleic acid molecule encoding an infectious, pathogenic PCV2 which has an immunogenic ORF2 gene from a nonpathogenic PCV1 in place of an ORF2 gene of the PCV2 nucleic acid molecule.